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Astronomy.' Jamieson 'On Map-Making.' Galbraith's 'Mathematical Tables.' Simms 'On the Sextant.' Jackson's 'Military Surveying.' Norie's 'Navigation.' Simms 'On Mathematical Instruments.' Saxby 'On Projection of Sphere.' Belcher 'On Surveying.' 'Sullivan's Geography.' Galbraith 'On Surveying.' Haskell 'On Field-work.' Castle 'On Engineering.' 'Brinkley's Astronomy.' 'Hutton's Mathematical Dictionary.' (2 vols.) 'Herschel's Astronomy.' 'Airy's Mathematical Tracts.' 'Airy's Trigonometry.' 'Chambers' Astronomy.' 'Gordon's Time Tables.' Continuations of 'Transactions,' &c. &c.

ACCESSIONS to the MAP-ROOM.—'Atlas ueber Alle Theile der Erde,' on 27 sheets, by the author, J. M. Ziegler, Hon. Corresponding Member R.G.S. Map of Turkistan, to illustrate the 'Travels of A. Vámbéry.' Town of Palermo and environs; Topographical Map of the Province of Pisa; Geological Map of the Province of Pisa; presented by the Italian Minister. Islands of New Zealand, scale 1 inch = 20 miles (geographical), by J. Wilde, Esq., M.P. Ordnance Maps, 24 sheets.

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The first Paper was the following:—

1. *An Expedition across the Rocky Mountains into British Columbia, by the Yellow Head or Leather Pass.* By VISCOUNT MILTON and DR. CHEADLE.

LORD MILTON and his companion set forth, in the spring of 1862, to cross the continent of North America, through British territory, with a view to discover a practicable route which should be free from the risks attendant on a road too near the United States boundary. The Leather Pass, which lies in the same latitude as the gold-district of Cariboo, had been formerly used by the *voyageurs* of the Hudson's Bay Company; but the route from this to the settled parts of British Columbia by the headwaters of the Thompson River had never yet been trodden by a European. The travellers arrived at Fort Garry on the 7th of August, and after a severe winter, passed at a solitary hunting-station near the north branch of the Saskatchewan, commenced their journey of exploration in the following April. The country between the Red River and the Rocky Mountains they described as extremely fertile; rich prairies, ready for the plough, being interspersed with woods rich in timber for building and fencing. Coal-beds and ironstone exist in several places; and, in short, when the obstructions put in the way of settlement by the governing power are removed, and communication established between Canada and British Columbia, this would become one of the most valuable portions of the British possessions.

The road beyond Edmonton (the last station at which supplies can be obtained) was merely a pack-trail. At this place the party was finally formed: it consisted of seven persons, including a half-breed as guide, and an Indian, called "the Assiniboine," with his wife and son, who attended to the packhorses. During the following three weeks they progressed slowly over the spongy and boggy soil of the primæval forest, which stretches for 300 miles from Lake St. Ann's to the foot of the mountains. A great portion of this country was noticed to have been completely changed in character by the agency of the beaver, which formerly existed here in great numbers. The shallow valleys were anciently traversed by rivers and chains of lakes, which, dammed up along their course at numerous points by the work of these animals, have become a series of marshes in various stages of consolidation. So complete has this change been, that hardly a stream is found for a distance of 200 miles with the exception of the large rivers. The animals have thus destroyed, by their own labours, the waters necessary to their existence. On the 11th of June they struck the Pembina River, a tributary of the Athabasca; a clear, shallow stream, flowing there nearly due north between perpendicular banks, which show, on either side, the section of a magnificent coal-bed, from 15 to 20 feet thick. On the 16th they reached McLeod's River—another tributary of the Athabasca—a fine stream, about 100 yards wide, flowing between high banks thickly covered with pines, aspens, and birch. It was low and easily fordable, although subject to great floods at certain seasons, as evidenced by the large boulders and trees strewn high along the shore, and the masses of drift-wood accumulated at different points and turns of the river. On this stream also they discovered traces of gold. The party obtained their first view of the Rocky Mountains on arriving at the banks of the Athabasca River, which emerges from the head of the mountains through a narrow gorge, and, entering a wider valley, expands into a lake several miles in length. On its western bank is Jasper House, a winter station of the Hudson Bay Company, surrounded by snow-capped mountains. The scenery in the vicinity was described as most enchanting; all the lower slopes being covered with a carpet of wild flowers, of the most varied colours. Three days' march from Jasper House, along the valley of the Myette, brought them (on the 8th of July) to the watershed between the Pacific and Atlantic; and on the 10th they struck the Frazer River, which they found, even at this altitude, to be a stream of considerable size, rushing down a narrow rocky gorge. Here the great difficulties of the journey commenced, the only road being either through water, or along the almost precipitous cliffs of the narrow river valleys.

On the 14th they crossed a great number of streams ; many probably mouths of Moose River, an important tributary of the Frazer, flowing from the north. This grand fork of the Frazer is at the foot of a very high mountain, which has received the name of "Robson's Peak," and is the original Tête Jaune's Cache. It was the highest peak they had hitherto seen. The place at present called Tête Jaune's Cache they did not reach until three days afterwards. On the 17th two of the packhorses slipped into the torrent, and were swept away in an instant. One of them was rescued by the heroism of the Assiniboine, but the other, carrying all the spare clothes, instruments, tea, salt, and nearly all the ammunition, was lost. Another accident which befel them three days afterwards, in crossing the Canoe River (a branch of the Columbia), nearly cost two of them their lives ; for the raft became unmanageable, and plunging under the projecting trees on the banks its living freight was swept off like flies. Lord Milton was left in a dangerous position, clinging to a tree, whence he was rescued some time after by his companion. From this stream the party crossed to the valley of the Thompson River, passing one of its sources ; and following this for several days they finally came to a point where all traces of path entirely ceased, and an untrodden region of forest and torrent lay before them, which it was necessary to traverse in order to reach Kamloops, where alone they could obtain succour. They struggled through this difficult region for twenty-three days, living on their horses and the small quantity of flour that remained of their stock, and seven days afterwards they arrived, in an emaciated condition, at the Fort of Kamloops, where they were hospitably received by Mr. Mackay. In the Thompson and Frazer River valleys the travellers noticed a series of raised terraces on a grand scale. They were traced for 100 miles along the Thompson, and for about 200 miles along the Frazer River. The terraces were all perfectly uniform, and exactly corresponded on the opposite sides of the valleys. The explanation of these phenomena was to be sought in the barrier of the "Cascade Range," through which the Frazer has pierced a way lower down the valley. At a former period the valleys of the Frazer and Thompson seem to have been occupied by lakes which sunk successively, as geological convulsions caused rents in the barrier range and let out the water. With regard to the practicability of a road being taken across by the route they had come, Lord Milton believed that few engineering difficulties existed of any importance, but it would have to be *made* throughout the entire route between Edmonton and the valley of the Thompson. From Edmonton to Jasper House the surface is slightly undulating ; the lower ground swampy, and

everywhere covered with thick forest. From Jasper House, through the main ridge of the Rocky Mountains, the valley is for the most part wide and unobstructed, except by timber. The ascent to the height is very gradual, and the descent, though much more rapid, neither steep nor difficult. From Tête-Jaune's Cache (on the west of the main ridge) the only route runs along the narrow gorges of the Thompson, where the bottoms of the ravines are generally level. The great advantages of this line are that it lies far removed from the United States boundary, passes through a country inhabited only by friendly Indians, and forms the most direct communication between Canada and the gold regions of British Columbia.

The PRESIDENT, in returning thanks to Lord Milton and Dr. Cheadle, said that the paper gave not only a graphic description of difficulties gone through, which would do honour to any traveller, but it laid before them for the first time some important *data* with regard to the geography of this region. All that portion which related to the western flank of the Rocky Mountains was quite original, and the descriptions given had enabled Mr. Arrowsmith to make additions of some importance to his map, especially of the region between the Thompson and the Frazer. Of the various points in the paper, he would especially direct attention to those remarkable terraces which had been described in the account of the Thompson and Frazer River valleys. Lord Milton and Dr. Cheadle had explained how the older terraces indicated the beds of successive lakes, caused by the waters being dammed up by the barrier of mountains lower down, which had been broken through by successive ruptures. This barrier and its results, though on a much larger scale, might be compared to the dams made by beavers, so common on the eastern side of the mountains, which produced chains of smaller lakes and marshes in modern times. The only addition that he would make, as a geologist, to the explanation given, was, that the accumulation of these waters at different levels clearly proved the elevation of the land at different periods by great jerks or convulsions of nature, which had also caused the breaking down of the barriers at successive periods, and the consequent subsidence of the waters from higher to lower levels. It should be understood that there were periods when the interior of the North American continent consisted of large bodies of water, dammed up by rocky barriers, which had afterwards been broken through, letting off the water by gorges from the higher levels. He took some credit to himself for having persuaded his modest young friend, Lord Milton, to bring this very interesting paper before geographers.

MR. CRAWFORD eulogised the paper for the ample knowledge of the country which it conveyed, and observed that the soil must be very fertile for the horses to fatten upon the grass in the short space of two months. For two hundred years the country had been a British possession, originally given by Charles II. to Prince Rupert, and since that time the Hudson Bay Company had enjoyed a monopoly of trade there. He wished to know whether this Company were the obstructive party alluded to by Lord Milton as the obstacle to the cultivation of the 2,000,000 acres of fertile land mentioned in the paper? And whether he expected that they would make a road 700 miles in length through one of the most difficult countries in the world?

MR. DALLAS said he had been lately acting as the Governor of Rupert's Land on behalf of the Hudson Bay Company. He could not answer for the conduct of the Company in former times; but from a knowledge of the past ten years he could state that, so far from any obstruction being offered to parties

wishing either to traverse the country or to come there as settlers, every assistance was afforded to them, even when the Company could ill afford it, both in money and provisions. In proof of this he need only refer to the year 1862, when a large body of Canadian emigrants, deluded by a Company formed in England with the ostensible object of providing means of transport across the country, were brought as far as Fort Garry and left there without any means of proceeding further. He was the means of rendering the poor emigrants assistance in the way of provisions and information of every kind, and had forwarded them across the country. He could confidently assert that there was no monopoly of trade in the Hudson Bay territories. Trade is free and open to every man, and the country is equally open to settlement; indeed, the country is more free than in any part of the United States, because a man can settle in any place he pleases, and is not called upon to pay for his land until it has been surveyed. With regard to the "benches" which had been observed in the upper part of the Frazer River valley, he could say that they were to be found extending over a vast tract of country. The upper waters of the Columbia River forced their way through a series of gorges, similar to those of the Frazer, in passing through the Cascade Range; and the whole of the country to the eastward and northward was more or less a series of these most extraordinary "benches." They rose tier upon tier, and extended across the country in a straight line, broken here and there by valleys, forests, and other obstructions. They were so clearly marked that they left no doubt on the minds of the Indians that the whole country had at one time been submerged, and that the water had been drained off at successive periods. In travelling to the southward, the Indians pointed out in the Blue Mountains a spot where they said there was the trunk of a tree, denuded of its branches, lying on the ground at a higher level than the limit of the growth of trees. They stated that no tree of the kind grew in that part of the world, and that it had been conveyed there in former ages by water.

Lord MILTON, in explaining the nature of the grass found in British Columbia, the "bunch" grass, said that wherever the mountains and valleys are free from woods, the country is generally covered with this kind of grass, except in some of the very lowest levels close to the edges of the rivers. The bunch grass is as good as corn for the sustenance of sheep and cattle during the summer and autumn; but it had this disadvantage, that it only grew on a light sandy soil, and it grew better on the "benches" than anywhere else. Cattle pulled it up by the roots, and sheep eat it so close that when winter comes the frost kills it. Unlike other grass, it takes three or four years for each plant to come to perfection: it does not grow thickly, so that a large tract of it is very soon destroyed. With regard to the road, he hoped there would soon be one carried by the line of Tête-Jaune's Cache to Cariboo. The country between Jasper House and Canada offered every facility for a road, and even for a railroad. There was plenty of coal. He had seen coal 22 feet thick, without shale either above or below. The Pembina River ran between two solid walls of coal, with sandstone above and below, and it could be worked by a gallery without any of the ordinary difficulties we are obliged to contend with in this country. It is a soft coal, burns with a dull heavy flame and a great deal of smoke, and is very bituminous. The engineering difficulties in the way of making a road would be comparatively small, and, with a well-organised party and plenty of provisions, there would be no difficulty in making a sound and permanent road all the way.

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The next Paper was—

2. *On the new country of North Australia discovered by Mr. John Macdougall Stuart.* By MR. STUART.

THIS was a brief account of the fertile region between the centre